

**CURRENT CLAIMS**

1. A quality control process for detecting physical and/or chemical changes in a CMP slurry, comprising the steps of:

5 transmitting radiation through a flow of a slurry as used in a chemical mechanical planarization (CMP) process, the radiation having one or more wavelengths;

determining transmission of the transmitted radiation at each of the wavelengths; and

10 monitoring transmission, over time, to detect physical and/or chemical changes of the CMP slurry.

2. A process of claim 1, further comprising determining a slope of transmission as a function of the wavelengths.

3. A process of claim 1, further comprising the step of detecting changes in the particle size distribution of the CMP slurry.

15 4. A process of claim 3, further comprising the step of determining a change in the slope, over time, the change in slope indicating change in the particle size distribution.

5. A process of claim 3, further comprising determining a slope of a logarithmic of transmission.

20 6. A process of claim 1, further comprising the step of determining a slope of a logarithmic of transmission as a function of the wavelengths.

7. A process of claim 6, further comprising the step of determining a change in the logarithmic slope, over time, the change in the slope indicating change in a particle size distribution of the CMP slurry independent from a change in particle concentration.

25 8. A process of claim 1, further comprising the step of detecting changes in the particle size distribution of the CMP slurry wherein the particle size distribution corresponds to a value between about 0.03 and 1.0 micron.

9. A process of claim 1, further comprising the step of detecting changes in  
30 the particle size distribution of the CMP slurry wherein the particle size distribution corresponds to a value above about one micron.

10. A process of claim 1, wherein the step of transmitting the radiation comprises transmitting the radiation through the flow having a diameter of about 100 microns.

11. A process of claim 1, wherein the step of transmitting the radiation  
5 comprises transmitting the radiation through the flow having a diameter of between about 100-2000 microns.

12. A process of claim 1, wherein the step of transmitting the radiation comprises transmitting the radiation through a sample cell selected on the basis of desired accuracy.

10 13. A process of claim 12, further comprising selecting a sample cell defining a flow diameter of about 100 microns.

14. A process of claim 12, further comprising selecting a sample cell defining a flow diameter of between about 100-2000 microns

15 15. A process of claim 1, wherein the step of determining transmission comprises determining transmission to an accuracy of at least about 1%.

16. A process of claim 1, wherein the step of transmitting comprises utilizing a grating to select the wavelengths of the radiation.

17. A process of claim 1, wherein the step of transmitting comprises using a laser.

20 18. A process of claim 1, wherein the step of transmitting comprises utilizing at least two filters to select the wavelengths.

19. A process of claim 1, further comprising generating a warning corresponding to the changes.

25 20. A process of claim 1, further comprising the steps of detecting changes in the particle size distribution of the CMP slurry and of comparing the transmission to a reference transmission indicative of a preferred particle size distribution within the flow.

21. A process of claim 20, further comprising the step of storing the reference transmission in memory.

22. A process of claim 1, further comprising the steps of

30 (a) detecting changes in the particle size distribution of the CMP slurry

(b) storing a plurality of reference transmissions, each reference transmission corresponding to a particular CMP slurry flow and particle distribution, and

(c) selecting one reference transmission and comparing the transmission to the selected reference transmission.

5        23. A process of claim 1, further comprising utilizing Mie theory to calculate particle sizes within the CMP slurry.

24. A process of claim 1, further comprising comparing transmission information with an empirical curve of extinction efficiency versus particle size diameter to determine particle sizes within the CMP slurry.

10       25. A process of claim 24, wherein the particle size diameter comprises a function of  $(\pi) D / \lambda$ , where  $D$  is the particle size diameter and  $\lambda$  corresponds to wavelength associated with the transmission.

26. A system for evaluating chemical mechanical planarization (CMP) slurry quality in a process, comprising:

15       a light source generating a beam of electromagnetic radiation for transmission through a flow of a slurry as used in a CMP process;

a spectral discriminator for isolating at least two wavelength bands of the radiation prior to transmission of the radiation through the flow;

a detector for detecting radiation transmitted through the flow; and

20       a processor for evaluating transmission of the wavelength bands through the flow to determine physical and/or chemical changes of the CMP slurry.

27. A system of claim 26, wherein the discriminator comprises two wavelength bandpass filters.

28. A system of claim 26, wherein the discriminator comprises a filter wheel.

25       29. A system of claim 26, wherein the discriminator is selected from the group consisting essentially of a laser and a grating.

30. A system of claim 26, wherein the processor comprises a computer.

31. A system of claim 26, further comprising memory, coupled to the processor, for storing one or more reference transmissions, each reference transmission corresponding to a particular CMP slurry flow and particle size distribution,

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the processor selecting one reference transmission and comparing the transmission to the selected reference transmission to detect changes in the particle size distribution.

32. A system of claim 26, further comprising memory, coupled to the processor, for storing data indicative of extinction efficiency as a function of particle size diameter, the processor comparing the transmission to the data to determine particle sizes within the CMP slurry.

33. A system of claim 26, wherein the processor comprises processing means to calculate a logarithm of transmission at each wavelength band and to determine a change in slope of logarithmic transmission versus wavelength band to detect changes in particle size distribution of the CMP slurry independently from changes in particle concentration.